FEASIBILITY STUDY
BOSTON REDEVELOPMENT AUTHORITY
W. CHESTER BROWNE AND ASSOCATES, INC.
Project #73962

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PRELIMINARY DRAFT
FEASIBILITY STUDY
FOR
PROTOTYPE PLANS
FOR A
MULTI-STORY LIGHT MANUFACTURING PLANT
IN THE
SOUTH END URBAN RENEWAL AREA
IN THE CITY OF BOSTON

REPORT NO. 1

March 14, 1963

Prepared for
BOSTON REDEVELOPMENT AUTHORITY
BOSTON, MASSACHUSETTS

PREFACE

The purpose of this study is to develop a prototype multi-story building of low cost and maximum architectural quality for light industrial use, with drawings, specifications, analyses and cost data that will clearly demonstrate to the Boston Redevelopment Authority and substantial private developers, the feasibility of multi-story industrial buildings for lease at lowest possible rentals in the South End Urban Renewal Area.

Four basic functions comprise the fundamental spaces required for the operation of the majority of industrial enterprises. They are Administration, Manufacturing, Receiving and Shipping. Since industrial processes are many and varied, the design of a prototype industrial installation will be tailored to afford maximum flexibility for the greatest number of prospective tenants.

It will be designed with maximum bay spacing consistent with practical economical engineering practice to eliminate columns as much as possible.

The usual standard utilities will be provided. Provision will also be made to accommodate the installation of special or additional utilities that may be required by certain tenants.

Vertical transportation will be provided by freight elevators, properly sized and spaced to adequately serve the tenant areas and passenger elevators designed to handle the building population.

Availability of ample and ready access for receiving and shipping is vital to the efficient operation of each tenant. This includes sufficient off-street loading platform space

together with truck [illegible] area [illegible] loading, space for [illegible] waiting trucks.

Common toilet facilities for a group of tenants are not desirable. This is a matter of supervision and control of personnel. Each tenant area will be provided with its own toilet facilities.

Sufficient off-street parking space for [illegible] will be provided.

TRANSPORTATION FACILITIES AND OFF-STREET PARKING [illegible]

Excellent public transportation is provided in the South End area from any section of the City of Boston by the Metropolitan Transit Authority. The elevated rapid transit through Washington Street has stations in the South End at Northampton Street and Dover Street. The Huntington Avenue Subway Rapid Transit which traverses the South End on the west has subway stations adjacent to the South End at Massachusetts Avenue (Symphony Station) and near West Newton Street (Mechanics Station). Cross town bus service is provided which connect with these stations. There is additional bus service through Tremont Street which runs through the South End in a north-south direction.

The majority of the personnel who live in other sections of the city and are employed in these proposed industrial establishments, will use the M.T.A. system going to and from daily work.

The proximity of new housing units to be constructed under the current program of the Boston Redevelopment Authority together with their emphasis on restoration and repair of existing residential buildings in the South End will influence and encourage the developer of industrial installations in the area. Leases will be more easily secured because potential lessees will recognize that their prospective employees will have the opportunity to live near their work. Families living in the neighborhood will benefit from this opportunity through reduced transportation costs and increased time for other activities - time and money that would otherwise be spent travelling to and from work.

Off-street parking space will be provided in the industrial sites for those who drive their automobiles to work and for visitors having business with the tenants. Because of the public mass transportation system available, the ratio of required parking spaces to building population will be much less critical for the urban than for a suburban industrial installation. The Urban Land Institute in Washington, D. C. published a Technical Bulletin in October 1952 which described ten planned industrial districts throughout the United States where sites are either leased or sold and the factory or warehouse building erected by either the site purchaser or the district developer. Most developers of these districts encourage construction of one story buildings and although there are generally no restrictions of height, the one story has evolved from economics of operation. The usual requirement is that the purchaser acquire a minimum of 50% more land area than needed for the building alone. In an industrial district in Atlanta, Georgia, the ratio is 6 to 1. The trend is toward providing larger tracts for automobile parking spaces. These parking space requirements vary throughout the various districts, i.e., spaces equivalent to 30% of the number of employees on duty at one time; one space for each 5 employees; one space for each 1,000 square feet of gross floor area.

We will apply the above ratios to a hypothetical prototype four story building containing 25,000 square feet per floor (4 tenant spaces at 6,250 square feet each), a total building area of 100,000 square feet and 16 tenant spaces.

Subtracting areas required for freight elevators, passenger elevators, exit stairhalls, toilets, and corridors, we estimate that

each tenant area will have a net usable area of 4,500 square feet. The density of occupancy of tenanted areas will vary, but if we allow an average of 100 square feet per person, we have a population of 45 persons per tenant area, a total building population of 720 persons.

Applying the Urban Land Institute parking ratios:-

1. Allowing one space for 30% of the population = 216 spaces required per building.

2. Allowing one space for each 5 persons = 144 spaces required per building.

3. Allowing one space for each 1,000 square feet gross building area = 100 spaces required per building.

The results indicate considerable spread in these planned suburban industrial districts.

We believe that available mass transportation facilities will reduce the required number of parking spaces for a South End industrial installation by at least 50%. If we allow one space for each 2,000 square feet of gross building area, each building will require 50 spaces. This is in the ratio of one space per 14 persons on the basis of a building population of 720 persons. If we allow one space for each 1,500 square feet of gross building area, each building will require 67 spaces. This is in the ratio of one space per 11 persons on the basis of a building population of 720 persons. We believe the latter is the preferable criteria.

IDENTIFICATION OF TYPICAL COMPANIES [illegible] A [illegible] TYPE INDUSTRIAL BUILDING AND THEIR REQUIREMENTS

A partial list of prospective tenants for this installations is as follows:-

Needle Trade Manufacturers - Apparel - Drapery.

Furniture Repair - Upholsterers.

Custom Footwear - Novelty Slippers.

Leather - Gloves - Billfolds - Novelties - Handbags - Findings.

Office Machine Repair - Typewriters - Adding and Business Machines, etc. - Rental - Drafting Room Equipment.

Janitors' Supplies - Industrial Cleaning and Maintenance.

Labeling Equipment - Labels.

Linen Supply Service.

Printing Jobbers - Stationery Suppliers - Graphic Arts.

Mailing - Advertising Services.

Rubber Stamps - Marking Devices - Nameplates.

Reproduction Service - Blueprinting - Photostat - Microfilm - Enlargement - Mimeographing.

Vacuum Cleaning Equipment - Supplies - Parts - Repair.

Distributors - Smallwares - Notions - Novelties.

Displays - Decorations - Novelties - Manikins - Advertising Exhibits.

Jewelry - Optical - Supplies - Repairs - Findings.

Musical Instrument Distributors - Repair - Service.

Picture Framing - Mirror Framing - Custom.

Electronics - Small Parts Manufacturing and [illegible].

Electric Appliance Distributors - Electrical Supplies - Sound Equipment - Television - Communication Systems - Radio Appliance Dealers - Washing Machines - Water Coolers, etc. - Sales Distribution - Service - Repair.

Lighting Fixtures - Repair - Maintenance - Lamps - Shades.

Plastic Products.

Floor Covering Distributors - Floor Machine Rental - Repair - Service.

Hospital Equipment Supply - Distributors - Laboratory Equipment Suppliers.

Housewares - Distributors.

Aluminum - Storm Windows - Jalousies - Screens - Venetian Blinds - Window Shades.

Pharmaceutical Supplies.

Instrument - Meter - Service - Repair - Distribution.

Coin Operated Machine Sales - Service.

The foregoing list of prospective occupants has been arranged in groups in an attempt to classify certain types of tenants that would have similar utility requirements.

It will be noted that many of the above are not necessarily manufacturers and that certain tenanted areas will be occupied as distribution centers, particularly by those tenants whose goods are, in the majority, distributed in the metropolitan area and therefore, would operate more economically from a location within easy distance of the downtown section.

It is believed that individual lease areas of approximately 6,000 square feet with opportunity for tenants to lease double, triple or quadruple areas on the same floor will offer good flexibility for the developer in securing leases.

A building with 25,000 square feet floor area will provide 4 tenant spaces of 6,250 square feet each. On the basis of this area, a 28' x 28' bay spacing conforms.

Eight bays, per tenant space, each space, 2 bays wide by 4 bays deep, will provide 6,272 square feet (56' x 112') per tenant. Four tenant spaces per floor will result in a building 4 bays deep by 8 bays long (112' deep x 224' long) 25,088 square feet per floor. If the 224' length is exceeded, an expansion joint through the building would be required. The depth could be increased up to 8 bays, each bay added would increase each tenant space area 1,568 square feet.

A practical story height for the prototype will be based on sufficient height in the manufacturing area to allow for overhead distribution of utilities such as air handling duct systems, clearance for lighting fixtures, unit heaters, and drainage systems from the floor above. If we allow 1'6" for these utilities and 1'0" for floor construction and 9'6" clear height, we arrive at a 12'0" story height. Ceilings are not normally required in the manufacturing, shipping and receiving areas.

The soffit of the slabs can be left exposed and painted. Overhead utilities, installed in an orderly fashion, are not objectionable in appearance and are readily accessible for maintenance or change.

Office areas will have suspended acoustical ceilings approximately 8'0" high, coordinated with stock height movable partitions which will be used where ceiling height office closures are required. The employment of 7'0" high movable partitions will be encouraged for office subdivisions where possible. Prefabricated movable partitions have many advantages. Manufactured in interchangeable units of modular width, they can be speedily erected or removed, and allow installation of floor covering and ceilings prior to erection. They can be obtained with factory applied finishes with lasting qualities that exceed field applied paint, thereby reducing maintenance cost. Changes in partition locations of units can easily be made by building maintenance personnel.

Electric and telephone wiring may be installed in the wiring raceways provided in the base of units. A 4'0" module will be employed for movable partitions, acoustical ceiling suspension system and exterior wall fenestration of the office portion. It is believed this modular dimension will provide opportunity for sufficient flexibility of office subdivision to meet tenants' various requirements.

The main corridor through the building, the stairways, elevator shafts and toilets will be enclosed with permanent partitions. The main corridor will have a suspended acoustical ceiling approximately 8'0" high. The space above the acoustical ceilings may be used for some utility distribution. The acoustical ceiling panels will be the removable drop in type, supported on an exposed tee suspension system. This will provide ready access to the space above the ceiling for maintenance of existing or installation of additional utilities.

Subdivision requirements of different tenants will vary for factory and office areas and will not be known until the tenants are secured. Factory subdivisions such as shipping and receiving, stock room, tool cribs, etc., can be installed to meet the tenants' needs. The separating partitions may be movable interchangeable, stock units made of wire mesh in metal frames. Office subdivisions will also be installed to meet the tenants' requirements.

FINANCIAL, STRUCTURAL AND [illegible] CONSIDERATION

Existing space is available in suburban one story buildings for $1.00 per square foot per year net, the tenant also paying for maintenance and taxes, or space may be leased for $[illegible] per square foot including heat, power and light. The properties have adequate loading platform and automobile parking space.

Existing space is available in loft buildings in the in-town Boston area for $1.00 to $1.50 per square foot for first floor and $.50 to $2.00 per square foot for upper floors (includes heat and light). The majority of in-town properties have small bay spacing, inadequate shipping facilities (freight elevator, loading platform and truck [illegible]) and little or no automobile parking space.

The prototype must be produced at a cost that will permit rental which is competitive with the above and yet offer adequate facilities that existing in-town properties lack. [illegible] this rental should be in the vicinity of $2.15 per square foot.

Extent of freight and passenger elevators to be provided must be determined. The number of passenger elevators required is determined by a traffic study of the building population above the ground floor. On the basis of a 4 story building with [illegible] square feet per floor (4 tenant spaces of [illegible] square feet each tenant space averaging 45 persons, 180 persons per floor, the building population above the ground floor is 180 x 3 = 540 persons. The desirable passenger carrying capacity is 13% of the population in 5 minutes or 70 persons. A car with a capacity of [illegible] persons will carry 10 persons per normal trip.

For 35' travel (3 floors at 1[illegible]' and [illegible] of [illegible] feet per minute, the round trip time will be about [illegible] sec[illegible]. In five minutes, 2 cars will carry 75 persons and the waiting interval will be 40 seconds. This is acceptable, therefore, 2 passenger elevators, car capacity 1[illegible] persons, speed [illegible]00 feet per minute will be required. Each elevator will cost approximately $[illegible],[illegible].[illegible], exclusive of the cost of the shaft.

If the number of stories were increased to 6, the car capacity would be increased to [illegible] and the speed increased to 150 feet per minute. Cost of each elevator would be approximately $35,000.00.

No well defined formula exists for the selection of freight elevators for these buildings. The use to which they may be subjected can vary over a wide range. For efficient service, each bank of tenant areas in a building up to [illegible] stories high should be equipped with a freight elevator. Four tenant areas per floor will require 4 elevators. Size and capacity of the car [illegible] determined by evaluation of the freight traffic in terms of the quantity, size and weight of the pieces to be carried. Consideration must be given to the use of power trucks carrying palletized material. These trucks weigh from 3,000 to 5,000 pounds. Pallets vary in width from 48" to 54". For two pallet width loads the car width should be 10'. Car size should be 10' x 10' with minimum capacity of [illegible] pounds and minimum speed of 75 feet per minute. It should be designed for Class C loading so a one piece load of full car capacity can be accommodated. Each freight elevator will cost approximately $30,000.00 for a 3 story building, $3[illegible],[illegible].00 for a 6 story building,

exclusive of the cost of the [illegible].

Freight and passenger elevator service [illegible] building having a total floor area of 100,000 square feet (25,000 square feet and 4 tenant spaces per floor) [illegible] an initial cost of approximately $[illegible] - [illegible] per square foot for the building area and about $[illegible] per square foot of floor area.

The same service for a [illegible] story building having a total floor area of 150,000 square feet (25,000 square feet and 4 tenant spaces per floor) will represent an initial cost of approximately $214,000.00 - about $8.[illegible] per square foot for the building area and about $1.43 per square foot of floor area. This indicates a saving of approximately $.[illegible] per square foot for a [illegible] story building.

A building [illegible] stories high will require an additional passenger elevator and an increase in the freight facility, so the economy of adding stories to distribute elevator cost [illegible] at 6 stories.

Foundation costs for any site in the [illegible] that is not on the original Washington Street peninsula will add about $[illegible] per square foot of floor area to the cost of the building.

Consultation with responsible financial houses, realtors and potential developers indicate that these buildings will not be constructed on speculation. They are financed on the basis of secured tenant leases.

Analysis of various bay spacing for different structural floor systems in terms of merit and cost will be contained in our next report.

Systems considered in this investigation are:

1. Concrete flat slab.
2. Concrete beams and slabs.
3. Concrete joists and beams.
4. Concrete grid systems.
5. Concrete slabs, fireproofed steel beams.
6. Precast, prestressed floor systems.

Concrete flat slab buildings are ideally suited for industrial occupancy. Inadvertent overloadings are distributed and absorbed in a structure of this nature.

The Boston Code specifies minimum slab thickness requirements for flat slab systems to be not less than [illegible] the length of the panel or less than [illegible] inches. Structural [illegible] for conforming to this criteria will demonstrate that a [illegible] designed to sustain a live load of 150 pounds per square foot will cost very little more than that for 75 pounds per square foot. Adding the additional steel to the required slab thickness will provide a structure that will accommodate the 150 pound live loading. This would place the structure in the [illegible] manufacturing category and therefore increase its flexibility for admission of a greater number of prospective tenants. Foundation requirements would be increased but to a minor degree in the light of advantage gained for the additional cost.

Uniform bay spacing will allow employment of the most economical construction techniques and speed erection.

Repetitive use of forms and placement of reinforcing steel will reduce material and labor costs in reinforced concrete floor construction.

Irregular shaped and odd bay [illegible] will, [illegible] construction costs.

The square bay will prove most economical for [illegible] systems.

Analysis of various exterior curtain wall systems will also be contained in our next report.

Exterior bearing walls are not considered desirable for multi-story structures.

Exterior wall systems considered to merit analysis are:-

1. Masonry units.

2. Precast concrete panels which could be cast at the job or plant fabricated if proven economical. Panels can be given a variety of face treatments for architectural appearance.

3. Prefabricated, insulated panels [illegible] for office facades.

Utility requirements of prospective tenants will vary to a substantial degree. The requirements for a specific tenant will not be known until the lessee is secured. Requirements [illegible] tenant area can change with the change of lessee.

Modification of processes can change utility requirements in any tenant area. Certain tenants may require ventilation, air conditioning or humidification for their processes [illegible] adjacent tenants will have no use for them. Certain tenants will want air conditioning in their offices, others may not. Electric power requirements of different tenants will also vary a great deal.

The prototype will be designed in a practical sense to provide for these variables. Standard utilities such as electric, gas, hot and cold water, sewer, drainage and telephone will be

in all tenant areas. Risers, [illegible] will also be installed to facilitate connections [illegible] when required. A utility shaft through the building will be located in the manufacturing area with access panels to the shaft from each tenanted area. Special facilities [illegible] installed in these shafts to meet special requirements with little or no alteration to the building.

A similar but smaller shaft through the building will be located in the office area to accommodate tenants' [illegible] air conditioning.

A central transformer room should be provided in each building with electric closets on each floor containing a disconnect switch and separate meter for each tenant on the floor. Each building should be designed to install its own boiler room but if several buildings were to be constructed [illegible] the same developer, a single boiler room properly [illegible] could serve his project.

If Edison steam is available at the site and can be proven economical, a central mechanical service [illegible] be provided.

Condensate meters can be installed on each tenants' return line if it is desired to meter steam consumption.

In order to retain maximum ground floor area for rental, a partial basement for each building will be constructed large enough to contain the boiler or mechanical service area, transformer and electric service room, building maintenance, storage room and exit stairways. The freight elevator should be carried down to this level.

[illegible]

Some savings in construction costs could be effected if the higher allowable unit stresses for concrete and high strength steel permitted by the American Concrete Institute and American Institute of Steel Construction could be used in design instead of those permitted by the Building Code of the City of Boston.

If locations of sites finally selected for the housing development are not in conformance with Boston Zoning Regulations an appeal for variance must be filed with the [illegible] Board prior to application for a building permit.

RECOMMENDATION OF THE [illegible] SITE [illegible], BE USED FOR PROTOTYPE ARCHITECTURAL STUDIES

The Boston Redevelopment Authority has [illegible] a copy of a map developed by them entitled "South End Urban Renewal Area." Certain sites in the project area are designated as Industrial. One of these sites is located in the Castle Square area, another one is located adjacent to the Roxbury area, a third and smaller site is located adjacent to the Fitzgerald Expressway a few blocks south of Dover Street.

The Castle Square site is bounded by Dover Street, Tremont Street, Herald Street and Washington Street. Shawmut Avenue disects the site in a north-southerly direction about 300 feet from Washington Street. Holy Trinity Church is located in the latter block and is to remain and an existing industrial installation at the corner of Herald Street and Shawmut Avenue is also to remain. Two industrial installations are included in this block, fronting on Washington Street for a distance of approximately 700 feet from Herald Street and approximately 100 feet in depth. The remainder of this block is allocated to housing and a shopping center.

The plan indicates that the block bounded by Dover Street on the south, Tremont Street on the west, Herald Street on the north and Shawmut Avenue on the east be allocated to housing and industry. The industrial installation is to occupy a triangular portion of the block at the corner of Tremont Street and Herald Street. The block is about 500 feet in the north-south direction and 800 feet in the east-west direction.

Herald Street form the [illegible] allocated to the Industrial Institution for a distance [illegible] 550 feet from Tremont Street and the north-south leg [illegible] Tremont Street for a distance of about 550 feet. [illegible] block at the corner of Herald Street and Shawmut Avenue, approximately 200 feet by 150 feet is allocated to a [illegible] garage.

The industrial site adjacent to the Roxbury area is bounded on the west by Tremont Street, on the north by Hammond Street, on the east by Westminster Street and on the south by Sterling Street. Another map entitled "Downtown Boston" prepared by the Transportation Division of the Boston Redevelopment Authority and dated December [illegible] indicated that the proposed inner belt which is an extension of the present [illegible] Fitzgerald Expressway toward the westerly portion of the city [illegible] along the south boundary of this industrial site, adjacent to and south of Sterling Street.

The site including [illegible] Street is about [illegible] in the east-west direction and about 550 feet in the north-south direction. The opposite side of Hammond Street on the north is designated as housing. The opposite side of Westminster Street on the east is designated as housing.

We have reviewed the location of the various industrial sites with responsible potential developers and financiers and have discussed with them the advantages and disadvantages of the locations, the shape of the sites, accessibility to [illegible], opportunity for expansion and the effect of industrial

installations adjacent to housing installations.

* * * * * * * * *

The consensus of their opinion is that a concentration of industrial installations adjacent to the Fitzgerald Expressway and completely divorced from housing is a better approach to the problem. [illegible] agreed that the best solution would be to [illegible] the [illegible] [illegible] to industry from Dover Street south as far as possible [illegible] Harrison Avenue and the Fitzgerald Expressway, eliminating [illegible] streets such as Bristol, Thayer and Randolph Streets. This would create an area of substantial size for development to suit various tenants.

Circulation through the area would be correlated with the installations, off-street parking and truck dock areas.

The developer should be given every opportunity to meet the requirements of the tenant, to transfer title free [illegible] without encumbrances and offer flexibility in financial arrangements. Buildings could be erected by either the developer or the purchaser and could be one story or multi-story.

The westerly side of Harrison Avenue would be allotted to commercial installations, including some recreational facility, such as a bowling establishment and possibly a motel. This commercial installation would serve as a buffer between the industrial area and the housing area to the west. This industrial area has direct ingress and egress to the adjacent Fitzgerald Expressway which would expedite truck delivery and shipping and also minimize truck circulation throughout the housing area.

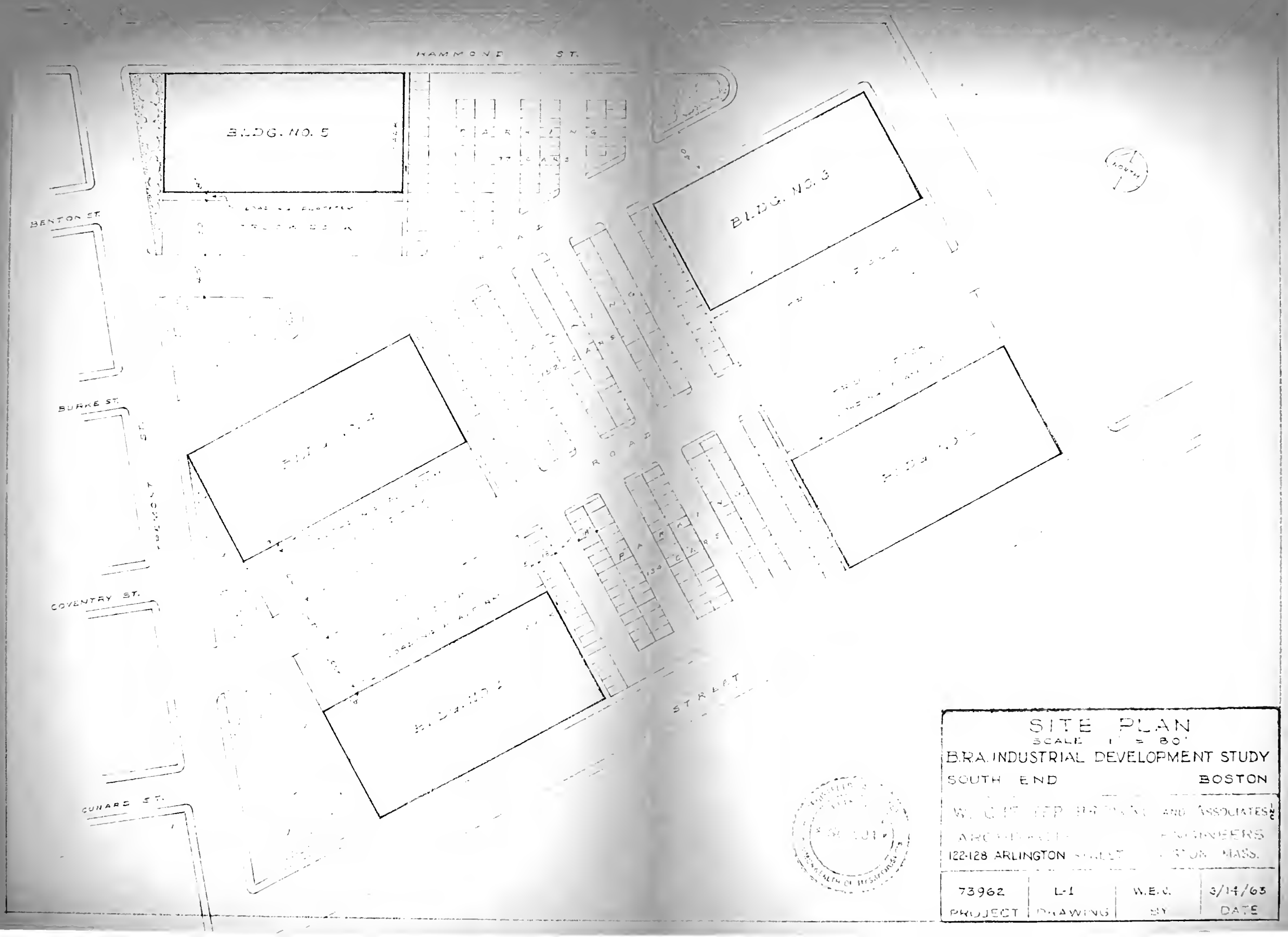
Separating the industrial area from the housing will [illegible] a minimum the hazard to children living in the housing area. They also stated that interspersement of housing and industrial installations adversely affects depreciation of both.

* * * * * * * * *

The Boston Society of Civil Engineers published a book entitled "Boring Data From Greater Boston." A set of maps accompanies the book, showing locations of the borings. A great number of them are in the South End area and indicate that subsoil conditions should be thoroughly investigated at any specific site in the area prior to the design of foundations for any structure. Areas adjacent to the Washington Street strip and the Roxbury district would probably call for caissons. Other sites in the South End will most likely require piles.

Borings to be taken for any proposed building will be located within the building area. Until the building [illegible] is crystalized we do believe that additional boring data will be required.

A 4 story building having a bay spacing of [illegible] will develop a column foundation load in the vicinity of 450 tons. The boring reports will determine the most economical foundation system to be employed.



SITE PLAN

SCALE 1" = 80'

B.R.A. INDUSTRIAL DEVELOPMENT STUDY

SOUTH END BOSTON

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ARCHITECTS ENGINEERS
122-128 ARLINGTON STREET BOSTON, MASS.

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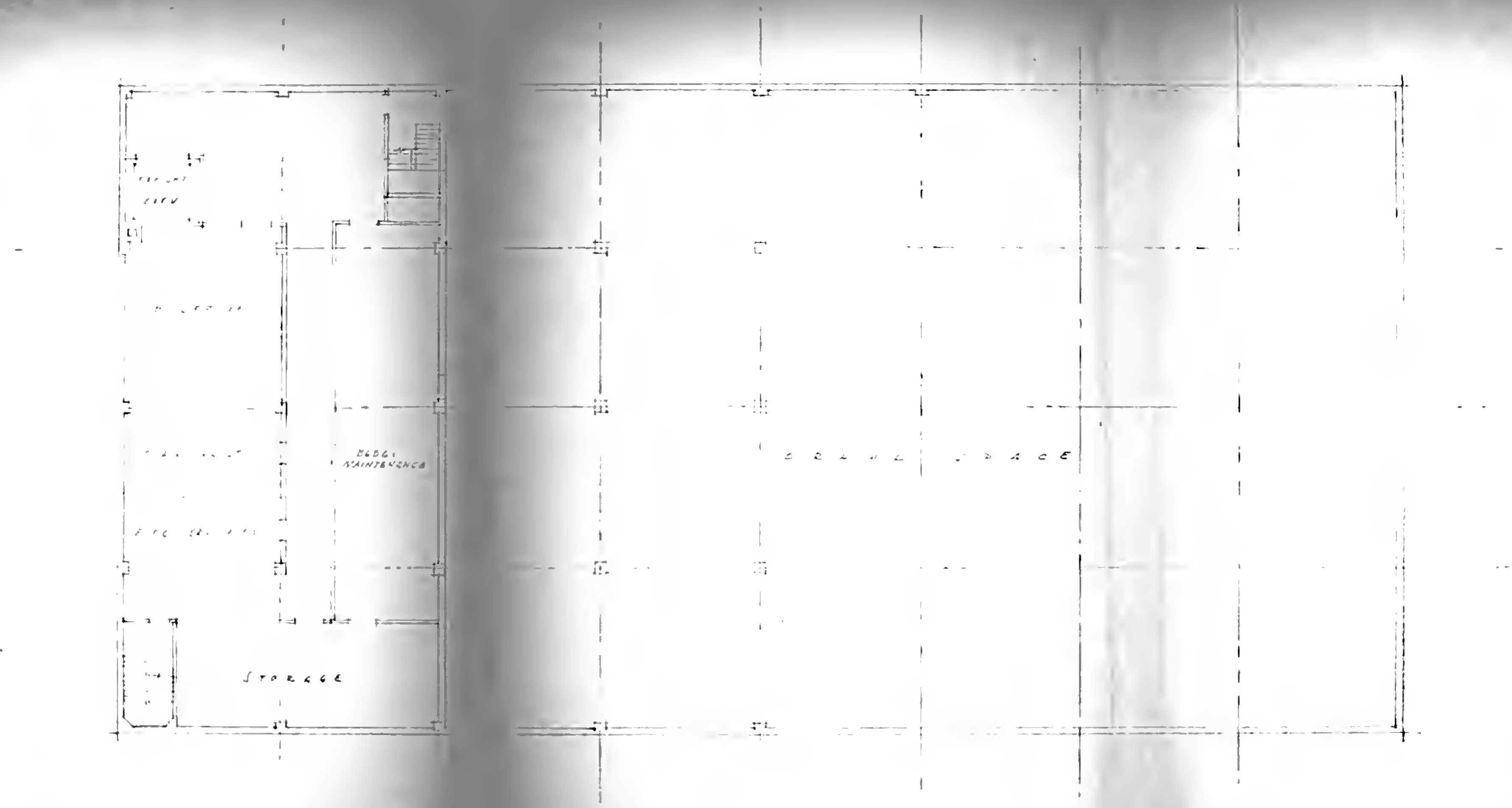
PROJECT	DRAWING	BY	DATE



BASEMENT PLAN
SCALE 1/16"=1'-0"

SCHEME "A"

No. 604

TYPICAL BUILDI
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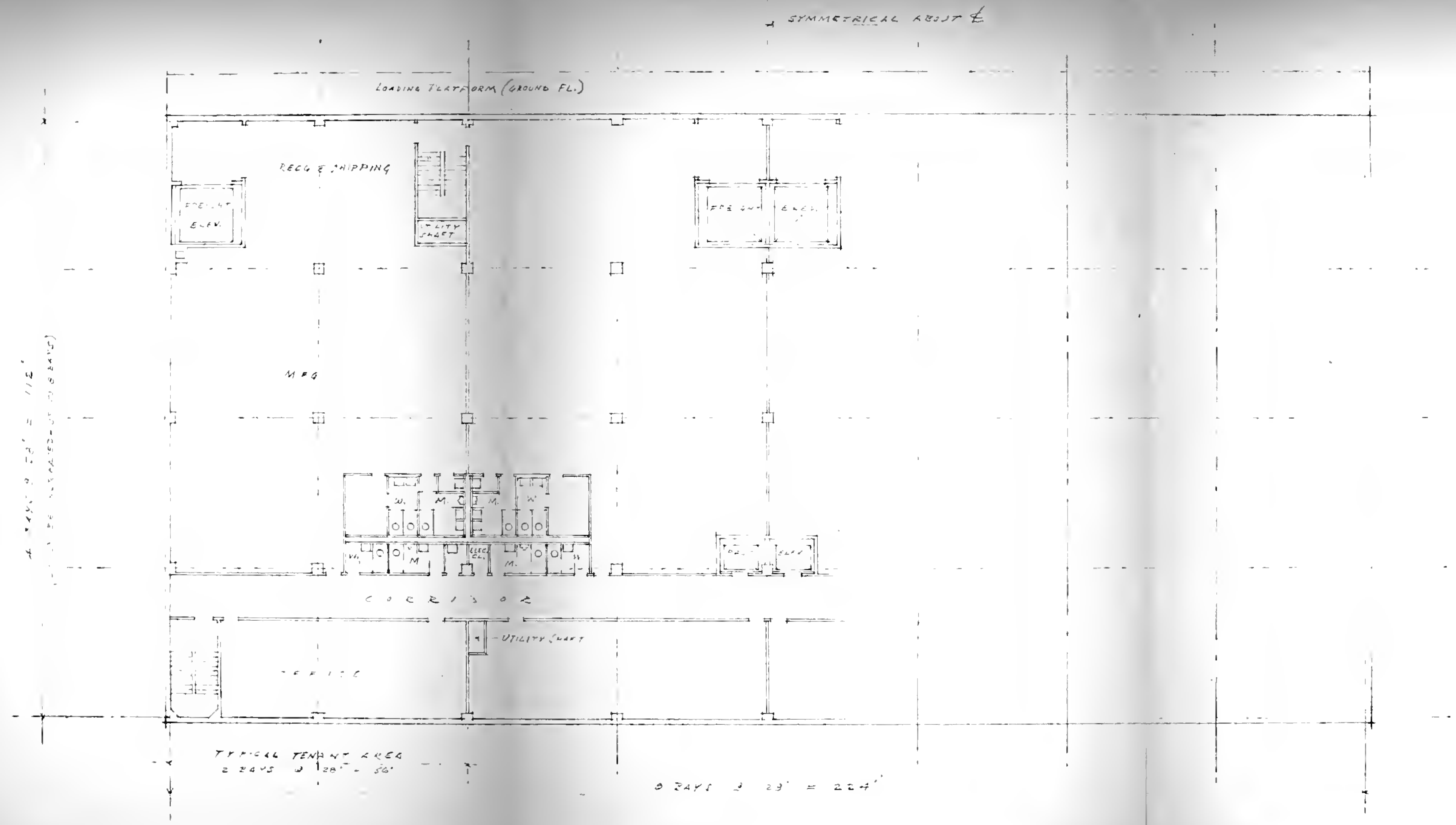
SOUTH END BOSTO

73962 PROJECT	A-1 DRAWING	[illegible]	3



TYPICAL FLOOR PLAN
SCALE 1/16" = 1'-0"

SCALE "A"

TYPICAL BUILDING
[illegible] DEVELOPMENT STUDY
SOUTH END BOSTON

[illegible] BROWNE AND ASSOCIATES
ARCHITECTS ENGINEERS
[illegible] STREET BOSTON, MASS.

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